FILED
11-02-07
04:59 PM

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to establish the California Institute for Climate Solutions	Rulemaking 07-09-008

COMMENTS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY (CALTECH) ON THE ORDER INSTITUTING RULEMAKING TO CONSIDER ESTABLISHING CALIFORNIA INSTITUTE FOR CLIMATE SOLUTIONS

November 2, 2007

David B. Rutledge
Division Chair, Engineering and Applied Sciences
California Institute of Technology
1200 E. California Boulevard
Pasadena, CA 91125
626-395-4100
626-793-5373 (fax)
dave.rutledge@caltech.edu

Order Instituting Rulemaking to establish the California Institute for Climate Solutions	Rulemaking 07-09-008

COMMENTS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY (CALTECH) ON THE ORDER INSTITUTING RULEMAKING TO CONSIDER ESTABLISHING CALIFORNIA INSTITUTE FOR CLIMATE SOLUTIONS

The California Institute of Technology (Caltech) respectfully submits comments to the California Public Utilities Commission (CPUC) with regard to the University of California's proposed California Institute for Climate Solutions (CICS). These comments also reflect the position of the management of the Jet Propulsion Laboratory (JPL), a national lab which Caltech has managed for NASA for half a century and which has more than 100 active research and technology projects with the Caltech campus faculty at any given time.

While Caltech/JPL endorses the concept of an institute dedicated to advancing the level of knowledge that can lead to addressing global climate change effects in the most immediately effective and long-lasting ways possible, Caltech/JPL urges the CPUC to ask UC to revise its proposal with regard to four critical parameters:

1. Streamline the governance structure and provide for broader representation of qualified stakeholders such that no one organization represents a majority of either the governing board, which would hire the director without regard to her/his affiliation, or advisory panels.
2. Create a peer-reviewed open competition for research and education program awards, employing successful extant models as guides.
3. Review and revise the budget plan to ensure that it provides for inclusion by all qualified potential grantees and contractors.
4. Establish outcomes-based performance measures that serve both as an accountability tool for the institute's funders and a yardstick of progress for the institute's management.

We further urge the CPUC to exhort the UC President to select his proposal-revision panel from a variety of public and private stakeholders, such that none is represented as a majority – including UC – on this panel.

Caltech/JPL has a robust pool of talent working on aspects of climate monitoring and renewable energy sources – including the Power the Planet project, funded by the National Science Foundation; the Caltech Center for Sustainable Energy Research, funded primarily by the Moore Foundation; and NASA-funded satellite-based instruments – more than 50 percent of which JPL is responsible for – that directly contribute to climate research and global modeling in regional, national, and worldwide collaborations.

In response to the Commission's solicitation of responses to specific questions posed by its staff, Caltech/JPL offers the following comments:

(1) Is there a need for the kinds of research and educational programs outlined in the proposal?
Yes. Perhaps the most telling public indication of human understanding of the need to learn more about the causes and effects of climate change is reflected in the 2007 Nobel Peace Prize's citation of the work of the Intergovernmental Panel on Climate Change for its work "to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change." California has long led the nation in taking steps to address the quality of its air, water and soil, thereby attracting to its universities and national labs many of the world's best minds in relevant fields of education and research. The value of supporting evermore sophisticated global climate modeling – as well as advancing the state of the art of solar-driven fuel synthesis, solar electric generation, and fuel cells using renewable fuels use, to name just a few examples – is at the heart of humankind's only realistic opportunity to find solutions within a useful time scale. As has been noted by Caltech Chemistry Prof. Nathan Lewis, circumstances – including some of our own collective making – have created a one-time-only experiment with our environment; failure to solve the problem will certainly imperil the quality of life, if not the sustainable existence, of the human species.

(2) If so, should they be centralized in a manner similar to that described in the UC proposal?
As stated in our introduction, the CICS proposal before the Commission should be the subject of a qualified-parties' gathering that would expeditiously craft revisions to the proposed governance structure, competitive research award system, and budget, with the aim of creating a more effective, nimble, and broadly representative organization. The UC President should then report back to the Commission within a period of the Commission's choosing, but no more than a matter of a few months. One core CICS principle must be that representatives of no sector should constitute a majority of the governing board, which should be tasked to hire the most qualified person to direct the Institute. The same principle must govern the population of all advisory or review panels. Fundamentally such a process would better leverage California's intellectual and infrastructural resources.

(3) Is the budget identified in the UC proposal reasonable given the goals of the institute?
Any significant supplementation of funding (such as $600 million over the next decade) for climate solutions research, education, and training is a plus for Californians. That said, a rigorous review of the budget's elements should be undertaken at the same time as a broader governance structure and a competitive research program are included in a CICS revised plan.

(7) Are there other funding sources, public or private, that should contribute to the institute?

The three independent research universities in California (Caltech, Stanford and USC) compete successfully, sometimes in collaboration with UC researchers, for more than $1.5 billion per year in Federal science and engineering research funding, and even more than that amount of Federal funding supports the JPL and SLAC national labs. This funding, as is the case with UC's Federal research support, is based on long-established and thoroughly audited analyses of the real costs of university research, and the same model should be employed by CICS. Additional research funding is awarded to the three universities from private sources. The proposed institute would leverage these assets by promoting additional interaction with the research, education, and training programs at UC, CSU, and the Community College System.

(9) How should funds be allocated between administration, technological research, public policy research, and educational programs?
Budget allocations should be one of the key topics for review and revision by the broadly representative panel that the UC President should convene to revise the proposal. Primary to such reconsideration should be the establishment of budget practices that provide fair access and full support for all qualified potential grantees and contractors to apply for awards.
While a 2006 U.N. report notes that alternative energy and energy efficiency research commands the lion's share of global R&D in the inquiry areas identified by the CICS proposal, more research funding is needed both for renewables and for climate research and modeling. The latter, which does not yet attract substantial private funding, should include (a) collecting climate relevant data from satellites, aircraft, and in-situ instruments; (b) using the data to improve our understanding of regional climate change interactions and feedbacks; (c) improving forecasts of regional impacts; and ultimately (d) developing mitigation approaches and comparing these through simulations and experiments to guide policy makers. These areas are potentially important investment opportunities for CSIS: they rely almost exclusively on federal and state funding, and data released this year by the U.S. Climate Change Science Program shows that inflation-adjusted Federal funding for climate science is projected to decline in 2008.

(10) How should the proposed governance structure be organized so that that the Commission maintains enough control to ensure that ratepayer funds are allocated so as to maximize ratepayer benefits?
We recommend that the governing board include representatives from California who have responsibility for implementing national climate change monitoring and research programs, as well as Californians conducting fundamental science research on renewable low-/no-carbon energy. These representatives will be able to provide insights on national programs to ensure that the CPUC investments are synergistic with national efforts and not duplicative.

(11) What performance measures or other general guidelines should be placed on funding to ensure that funds are used efficiently and in a manner that maximizes ratepayer benefits?
Besides being a generator of knowledge through publications and a facilitator of quantifiable education and training activities, CICS should provide regular accountability

reports to CPUC about outcomes derived from its investments. As stated earlier, we recommend that this issue be one of the four topics to be taken up by a revision panel and resubmitted to the Commission.

For significant demonstration projects or test beds (e.g., in excess of $50 million), the institute should utilize a phased development approach that includes system engineering methodologies: (a) a science-based requirements development phase, (b) a feasibility phase that identifies major system elements, identifies linkages between requirements, and performs trade-offs to identify optimal solutions for meeting requirements, (c) a detailed engineering phase that develops high confidence designs and costs. Transitions between these phases include formal design reviews. JPL has successfully used these tools to develop and deploy complex science missions.

Research, development and demonstration projects are typically unique, one-of-a-kind efforts. In these types of efforts, firm fixed-price contracts frequently do not lead to a lowest priced system because the "contractor" is forced to add significant cost reserve to account for uncertainties. In addition, many educational institutions and laboratories are not able to respond to firm fixed-priced solicitation. We would urge that the institute be encouraged to utilize contracting mechanisms, such as cost reimbursable contracts, which will allow all of the State's best institutions to participate.

(15) What additional priority program areas for research and education should be added to those outlined in the proposal?

Understanding and predicting regional or California climate change effects will benefit from the global perspective of satellite observations. In addition to current satellite measurements of cloud cover, air temperature, humidity, and sea ice cover, there are new satellite measurements planned in the near future, which will inform researchers, State lawmakers, and the public. These include the Orbiting Carbon Observatory (OCO) mission, which will make the first space-based measurements of atmospheric carbon dioxide with the accuracy and resolution needed to characterize its sources and sinks; the Aquarius mission, which will provide the first-ever global maps of salt concentration in the ocean surface needed to understand heat transport and storage in the ocean; and other planned NASA missions, which will provide satellite observations of soil moisture, dynamics of ice, and land surface vegetation.

The institute should consider ensuring its programs include an effort that (a) uses these global satellite assets, along with new regional airborne and ground-based instruments, to form an integrated strategy for regional monitoring of air, land and water for climate change; (b) uses these data to improve understanding of regional climate change, improve regional models, and develop new mitigation approach; and (c) uses simulations, experimental test beds and a system engineering methodologies to assess the regional impact of adaptation and mitigation strategies. This integration of observations, science, mitigation approaches, and analysis of options will provide State lawmakers and policy advisors with the information they need to assess mitigation options for the State.

The regional monitoring strategy should be developed by first defining observational requirements (e.g., GHG components, spatial resolution, accuracy, cost) based on inputs from the scientific community and policy makers. From this, a system engineering approach should be used to create an optimized observation network design that integrates in-situ, airborne and satellite data. Following this design and cost estimate, the

institute should incrementally deploy the data collection and integration system, and make the data readily available to all research institutions in the State to support. Caltech/JPL is well poised to make such an integrated effort succeed. At JPL alone are more than 1,000 system engineers and instrument engineers with significant experience designing and integrating the needed airborne, ground-based, and space-based instruments to create an integrated monitoring network. With nearly 100 of its scientists specializing in land, air, ice and oceans, JPL is currently able to use these monitoring data with university partners to improve climate change models and analyze alternatives to mitigate climate change in the region.

(16) Given that it is the Commission's intent to draw on the resources of not only UC, but also Caltech, Stanford, USC, California State University and the Community College systems, is the organizational structure described in the proposal a suitable framework to efficiently and effectively coordinate this kind of broad participation?
The proposed governance structure is too exclusive to take full advantage of all of the State's public and independent research, education, and training assets. In our introductory comments, Caltech/JPL identified four critical principles that should be embedded in the CICS structure from the start.

(17) How can the Commission ensure that the institute's educational outreach and worker training programs reach diverse communities in California?
The Commission can ensure an effective educational outreach program by leveraging the resources and networks that are already in place through other programs. For example and in addition to Caltech's campus-based educational outreach programs, by using Federal funding JPL has assembled a team of 20 professionals with the sole purpose of ensuring that educators and students from all geographic areas are engaged in earth and space science programs. These efforts include bilateral workshops, educator conferences, visiting educator programs, content development and curriculum development, and outreach programs devoted specifically to minority education. In 2006, these formal and informal programs engaged 37,263 teachers and 266,390 students. During the same year, JPL web videos were downloaded more than 2.5 million times, and audio podcasts were played half a million times. Furthermore, JPL has created a novel "Solar System Ambassador Program," a formal network of some 500 volunteers across the country who provide outreach support to both students and the general public in their communities. With minor changes, programs like these can be leveraged to reach even more communities in California than they already serve.

(18) If research conducted by the Institute results in profitable technologies or patents, should some portion of the profits be used to reimburse ratepayers for the cost of the research? If so, how should this be structured?
The research universities and national labs in California lead the country in transferring technology to the marketplace, and California directly benefits from this entrepreneurial activity. Governing this activity is the Bayh-Dole Act, which makes research collaborations among universities virtually seamless. The addition of a new layer of regulation on this process would create significant, sometimes insurmountable, disincentives for the robust research partnerships that redound so greatly to California's

benefit at present. Moreover, alteration of the current process might well complicate, if not make impossible, the leveraging of institute support with Federal research funds.

SUMMARY: The science and engineering research resources available at the independent research universities and national labs in California – as well as the education and training assets available at the California State University and the California Community College systems – should make it self-evident that the current CICS proposal requires revision. California's public and independent academic community has been in numerous thoughtful discussions about what revisions would best address the overly exclusive nature of the present UC proposal, and we appreciate CPUC's extension of the party comment period. While we appreciate UC's expression of interest in optimizing the CICS concept, one step must be taken to ensure broader representation, participation, and effectiveness of such an institute:

> The University of California Office of the President has indicated strong support for gathering a broadly representative group of experts to revise and streamline the CICS proposal, and Caltech/JPL strongly supports this idea and would welcome an opportunity to participate. This policy perfection process could be accomplished expeditiously by employing existing organizational structures and procedures as guides to ensure broad governing representation, peer-reviewed open competition, a re-examination of the proposed budget, and establishment of an outcomes-based performance evaluation mechanism.

As a result, we urge the Commission to assign the task of streamlining the CICS structure and broadening its governing and research participation opportunities to include all qualified researchers, educators and trainers to the UC President, who should be charged with inviting a broadly representative group of highly qualified stakeholders – with no sector or organization representing a majority – to make revisions to the CICS proposal and return to the Commission with an optimized proposal.

Dated November 2, 2007, at Pasadena, California.

Respectfully Submitted,

David B. Rutledge
Division Chair, Engineering and Applied Sciences
California Institute of Technology
1200 E. California Boulevard
Pasadena, CA 91125
626-395-4100
626-793-5373 (fax)
dave.rutledge@caltech.edu

PROOF OF SERVICE

I herby certify that on November 2, 2007, I have served a copy of **COMMENTS OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY (CALTECH) ON THE ORDER INSTITUTING RULEMAKING TO CONSIDER ESTABLISHING CALIFORNIA INSTITUTE FOR CLIMATE SOLUTIONS,** upon all parties listed on the Service List for this proceeding, R- 07-09-008. All parties have been served by email or first class mail, in accordance with Commission Rules.

David B. Rutledge
Division Chair, Engineering and
Applied Sciences
California Institute of Technology
1200 E. California Boulevard
Pasadena, CA 91125

Service List for R.07-09-008:

DONALD	GILLIGAN	donaldgilligan@comcast.net
CHRISTOPHER	HILEN	chilen@sppc.com
NORMAN A.	PEDERSEN	npedersen@hanmor.com
DR. RANDOLPH W.	HALL	rwhall@usc.edu
PROF. DAVID	RUTLEDGE	dave.rutledge@caltech.edu
DANIEL W.	DOUGLASS	douglass@energyattorney.com
AMBER E.	DEAN	amber.dean@sce.com
CASE	ADMINISTRATION	Case.Admin@sce.com
HOWARD	GOLLAY	howard.gollay@sce.com
LAURA	GENAO	laura.genao@sce.com
SUSAN	HACKWOOD	hackwood@ccst.us
TAM	HUNT	thunt@cecmail.org
DEVRA	WANG	dwang@nrdc.org
EVELYN	KAHL	ek@a-klaw.com
BRIAN	CRAGG	bcragg@goodinmacbride.com
IRENE K.	MOOSEN	irene@igc.org
MICHAEL	ALCANTAR	mpa@a-klaw.com
JAMES L.	SWEENEY	Jim.sweeney@stanford.edu
ANN M.	ARVIN, MD	aarvin@stanford.edu
LARRY	HORTON	lhorton@stanford.edu
ALEXIS K.	WODTKE	lex@consumercal.org
LLOYD C.	LEE	lloyd.lee@ucop.edu
SAMUEL S.	KANG	samuelk@greenlining.org
THALIA N.C.	GONZALEZ	thaliag@greenlining.org
EDWARD	VINE	elvine@lbl.gov
AUDRA	HARTMANN	Audra.Hartmann@Dynegy.com
VIRGIL	WELCH	vwelch@environmentaldefense.org
RONALD	LIEBERT	rliebert@cfbf.com
RYAN L.	FLYNN	Ryan.Flynn@pacificorp.com
CYNTHIA A.	FONNER	Cynthia.A.Fonner@constellation.com
GARY	HINNERS	ghinners@reliant.com
GARY A.	HINNERS	ghinners@reliant.com
BRIAN	MCQUOWN	bmcquown@reliant.com
ELENA	MELLO	emello@sppc.com
LEILANI JOHNSON	KOWAL	Leilani.johnson@ladwp.com
ROBERT L.	PETTINATO	robert.pettinato@ladwp.com
DEAN A.	KINPORTS	dakinports@semprautilities.com
RASHA	PRINCE	rprince@semprautilities.com
ALANA	STEELE	asteele@hanmor.com
DR. MARK ALLEN	BERNSTEIN	mabernst@usc.edu
ERIC	KLINKNER	eklinkner@ci.pasadena.ca.us
REN	ZHANG	rzhang@cityofpasadena.net
STEVE	ENDO	sendo@ci.pasadena.ca.us
HALL P.	DAILY	hdaily@caltech.edu
STEVEN G.	LINS	slins@ci.glendale.ca.us
BRUNO	JEIDER	bjeider@ci.burbank.ca.us
RICHARD J.	MORILLO	rmorillo@ci.burbank.ca.us
DON	LIDDELL	liddell@energyattorney.com

YVONNE	GROSS	ygross@sempraglobal.com
KIM	KIENER	kmkiener@cox.net
JEFFREY M.	GARBER	jmgarber@iid.com
MICHAEL E.	CAMPBELL	mcampbell@iid.com
GEORGE	DEHART	gdehart@anaheim.net
STEVEN	SCIORTINO	ssciortino@anaheim.net
AUDREY	CHANG	achang@nrdc.org
KAREN	TERRANOVA	filings@a-klaw.com
LEAH	FLETCHER	lfletcher@nrdc.org
NORA	SHERIFF	nes@a-klaw.com
SHERYL	CARTER	scarter@nrdc.org
STEVE	MCCOY-THOMPSON	smthomps@nexant.com
VALERIE	WINN	vjw3@pge.com
WILLIAM H.	CHEN	bill.chen@constellation.com
ANNE W.	KUYKENDALL	AWK@flk.com
JANINE L.	SCANCARELLI	jscancarelli@flk.com
JOSEPH F.	WIEDMAN	jwiedman@goodinmacbride.com
MARTIN A.	MATTES	mmattes@nossaman.com
ANDREW L.	HARRIS	alho@pge.com
CHRISTOPHER	WARNER	cjw5@pge.com
ED	LUCHA	ELL5@pge.com
KATE	BEARDSLEY	KEBD@pge.com
MEREDITH	ALLEN	MEAE@pge.com
SEBASTIAN	CSAPO	sscb@pge.com
ELLEN R.	AURITI	Ellen.Auriti@ucop.edu
JODY S.	LONDON	jody_london_consulting@earthlink.net
		mrw@mrwassoc.com
ROBERT	GNAIZDA	robertg@greenlining.org
MARCIA W.	BECK	mwbeck@lbl.gov
KAREN	NOTSUND	knotsund@berkeley.edu
LYNN	ALEXANDER	lynn@lmaconsulting.com
C. SUSIE	BERLIN	sberlin@mccarthylaw.com
JAMES	WEIL	jweil@aglet.org
ANDREW	BROWN	abb@eslawfirm.com
BRUCE	MCLAUGHLIN	mclaughlin@braunlegal.com
CHANGUS	JONATHAN	jonathan.changus@asm.ca.gov
DOUGLAS K.	KERNER	dkk@eslawfirm.com
JANE E.	LUCKHARDT	jluckhardt@downeybrand.com
JEFFREY D.	HARRIS	jdh@eslawfirm.com
VERONICA	VILLALOBOS	Vvillalo@usc.edu
WILLIAM W.	WESTERFIELD III	www@eslawfirm.com
LYNN M.	HAUG	lmh@eslawfirm.com
CATHIE	ALLEN	californiadockets@pacificorp.com
KYLE L.	DAVIS	kyle.l.davis@pacificorp.com
Beth	Moore	blm@cpuc.ca.gov
Carol A.	Brown	cab@cpuc.ca.gov
Christine S.	Tam	tam@cpuc.ca.gov
Jaclyn	Marks	jm3@cpuc.ca.gov
Janet A.	Econome	jjj@cpuc.ca.gov
Marion	Peleo	map@cpuc.ca.gov

Sachu	Constantine	sco@cpuc.ca.gov
Scott	Murtishaw	sgm@cpuc.ca.gov
CLARE	LAUFENBERG	claufenb@energy.state.ca.us